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DuPont Legal

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VIA FACSIMILE
9-011-49-89-2399-4465

The European Patent Office (IPEA)
Erhardtstrasse 27
D-80298 Munich, Germany

Attn: F. Randez Garcia

Re: International Application No. PCT/US99/25106
E. I. du Pont de Nemours and Company
Our Ref.: PE0612 PCT

Dear Sir:

REPLY TO WRITTEN OPINION

In response to the Written Opinion dated 24 August 2000, Applicant hereby submits an amendment to the specification and claims relating to the above-identified application as indicated below:

Page 2, after line 30, insert the following:

--M. Yamana et al., Deblocking Reaction of Chemically Amplified ArF Positive Resists, PROC. SPIE - INT. SOC. OPT. ENG., Vol. 3333, No. 1, pages 32-42 (June 1998) discloses deblocking reaction mechanisms and lithographic performance in chemically amplified positive ArF resists consisting of triphenylsulfonium triflate as an acid generator and the copolymer poly(carboxy-tetracyclododecyl methacrylate₇₀-co-tetrahydropyranylcarboxy-tetracyclododecyl methacrylate₃₀). EP 0 473 547 A (CIBA-GEIGY AG 4 March 1992) discloses certain olefinically unsaturated onium salts which can be polymerized and used as photosensitive copolymers in photoresist compositions. The photosensitive copolymers disclosed include branch copolymers containing protected acid groups and acid-generating groups.--

Page 3, line 5: after "segment" insert --, wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of least 1000--.

cc: J. Dodd

Page 3, line 17: after "heating" insert --, and wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of at least 1000--.

Page 20, line 13: after "photomask." Delete --Digital imaging with a laser is preferred.--

Claim 1. (Amended) A positive-working photoresist comprising:

(A) a branched polymer containing protected acid groups, said polymer comprising one or more branch segment(s) chemically linked along a linear backbone segment, wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of at least 1000; and

(B) at least one photoacid generator.

Claim 13. (Amended) The photoresist of Claim [1] 11 wherein

(a) the ethylencially unsaturated macromonomer component has a number average molecular weight (M_n) in the range of [500] 1000 to [40,000] 15,000;

(b) the linear backbone segment has a number average molecular weight (M_n) between [about] 2,000 and [about] 500,000; and

(c) the weight ratio of the linear backbone segment to the branch segment(s) is within a range of [about] 50/1 to [about] 1/10.

Claim 27. (Amended) A process for preparing a photoresist image on a substrate comprising, in order:

(W) applying a photoresist composition on a substrate, wherein the photoresist composition comprises:

(a) a branched polymer containing protected acid groups, said polymer comprising one or more branch segment(s) chemically linked along a linear backbone segment, wherein the branched polymer contains sufficient functionality to render the photoresist developable to afford a relief image, upon imagewise exposure to radiation selected from the group consisting of ultraviolet and violet and subsequent heating, and wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of at least 1000;

(b) at least one photoacid generator; and

(c) a solvent;

(X) drying the coated photoresist composition to remove solvent and thereby to form a photoresist layer on the substrate;

(Y) imagewise exposing the photoresist layer to form imaged and non-imaged areas; and

(Z) developing the exposed photoresist layer having images and non-imaged areas to form the relief image on the substrate.

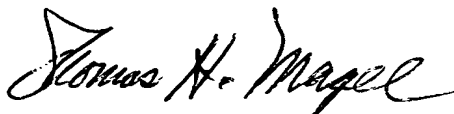
Applicant hereby submits replacement pages 2, 2A, 3, 3A, 20, 67, 68 and 72.

Support in the specification for the amendment to Claim 1 is found on page 5, lines 18-20 (claim limitation of the branch segment(s) having at least two repeating monomer units) and on page 4, line 20 (claim limitation, expressed as a preference, of the branch segment(s) having the lower limit of a range being about 1,000, i.e., a number average molecular weight of at least 1000). These same portions of the specification in addition provide support for the corresponding amendment made to process Claim 27. Support in the specification for the amendment to Claim 13 is found on page 4, line 20 (claim limitation for the macromonomer component more preferably having a number average molecular weight of about 1,000 to about 15,000). The deletion of the sentence on page 20, line 13, is due to an inadvertent error relating to a preference and does not introduce new matter.

In response to Section V relating to Claims 1-10, 14 and 27-29 not being novel or containing an inventive step over documents D1 (M. Yamana et al.) and D2 (EPO 0 473 547 A), Applicant respectfully submits that such claims now meet the requirements of Article 33(a) PCT in view of the amendments made to Claims 1 and 27. In particular, none of the cited documents show or suggest a branched polymer wherein the branch segment(s) not only contain at least two repeating monomer units but also have a number average molecular weight (M_n) of at least 1000, as now recited in Claims 1 and 27. And unlike document JP 10 031 310 A (February 1998) cited in the search report, our claimed invention excludes diethylenically or higher unsaturated monomers in synthesis of the branched polymer, i.e., no crosslinked structures in the resulting branched polymer.

In view of the above, reconsideration of this application, in particular amended Claims 1 and 27, is respectfully requested.

Very truly yours,



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Replacement pages attached